

Pennsylvania Egg Quality Assurance Program



PEQAP

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A Five Year (1994 – 1999) Critical Analysis of the Pennsylvania Egg Quality Assurance Program (PEQAP)

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SUMMARY. PEQAP is a voluntary *Salmonella enteritidis* risk reduction program in which 1,107 commercial layer flocks have been monitored in five years and two months (February 1994 to April 28, 1999). PEQAP is a cooperative program between the Pennsylvania Poultry Council (PennAg Industries Association), the Pennsylvania Department of Agriculture, the University of Pennsylvania (New Bolton Center), Penn State University, and the Pennsylvania Department of Health. The program includes risk reducing management practices, multiple-environmental and egg testing, a computerized database, and third party monitoring by the Pennsylvania Department of Agriculture. Overall 154 flocks (13.9%) had *S. enteritidis* positive environments. In single houses, 44 (9.8%) flocks, and in complexes, 110 (16.7%) flocks had *S. enteritidis* isolated from the environment. A comparison of flocks in houses monitored early in the program (1994) with flocks in the same houses in (1999), demonstrated a reduction in *S. enteritidis* environmental positivity from 25.7 % (18 of 70 flocks) to 7.3% (4 of 55 flocks). The number of environmental samples within these positive flocks also dropped from 35.8% (68 of 190) to 21.7% (10 of 46) from 1994 to 1999, respectively. Flocks housed in multiple house complexes were more likely to become exposed to *S. enteritidis* early after housing in the layer house. In total, 83 flocks (75.5%) had their 30 week environmental test positive as compared to flocks in single stand alone houses where 18 flocks (40.9%) had their 30 week test positive. A total of 933,900 eggs were cultured for *Salmonella enteritidis* and 146 positive eggs were isolated from 154 flocks. The overall prevalence of *S. enteritidis*-contaminated eggs from these environmentally positive flocks was 1.6 eggs/10,000 eggs produced. The number of contaminated eggs from flocks with *S. enteritidis* positive environments was higher in single stand alone houses versus complex houses with a prevalence of 2.0 eggs/10,000 eggs produced, compared to 1.4 eggs/10,000 produced, respectively. It has been estimated that greater than 70% of the cases of food borne illness due to *Salmonella enteritidis* are associated with the consumption of foods containing eggs. Between 1989 and 1997 there was a 50.0%, 48.6%, 55.4%, and 43.5% reduction in human *S. enteritidis* isolation rates per 100,000 population for the States of Pennsylvania, Maryland, New Jersey, and New York, respectively. Pennsylvania is the principal supplier of eggs to these States. PEQAP likely contributed to this combined 49.4% reduction of human *S. enteritidis* rates in the mid-Atlantic States.

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The Pennsylvania Egg Quality Assurance Program (PEQAP) is a voluntary industry program intended to minimize *Salmonella enteritidis* contamination of chicken eggs. The program assures commitment of the producer and processor to implementation of management and monitoring practices most likely to prevent *S. enteritidis* contamination. Preventive measures include placement of *S. enteritidis* clean chicks, intensive rodent control, cleaning and disinfecting between flocks, and comprehensive environmental monitoring of pullet and layer houses with continuous testing of eggs from any environmentally positive houses. Positive eggs are diverted for pasteurization. Eggs must be kept refrigerated from farm to table according to Pennsylvania State regulations. The Pennsylvania Department of Agriculture provides oversight, technical, administrative, and financial support to this program. The Pennsylvania Department of Health provides technical advice regarding public health implications. The University of Pennsylvania, New Bolton Center and Penn State University assist in culturing of samples and oversight.

Materials and Methods

Collection of environmental samples. Chick papers containing the meconium of baby chicks are sampled either at the hatchery or on arrival at the pullet house. Every tenth (10%) paper is sampled with a minimum of 75% of the surface area hand swabbed. The environments of replacement pullets are sampled at 10 – 15 weeks. In the layer houses samples of the environment are taken at these intervals: 29 – 31 weeks (30 wk), 44 – 46 weeks (45 wk) of bird age. For molted flocks environmental samples are taken 5 – 7 weeks (7 wk post molt) following the return to feed after each molt cycle.

Two manure samples were collected from each bank of cages. Four-by-four inch, 8 to 12- ply gauze sponges are saturated with condensed skim milk. A string attaches these to a solid aluminum rod. In high rise houses (deep pit) the complete length of the pit beneath each cage is walked and the swab is dragged across the manure pile with continuous contact. For shallow pit houses the two sponges are attached to the scraper assembly and the scraper is run to the entire length of the house. All scraper blades are sampled in cases where multiple scrapers are present. In houses with manure belt systems the sponges are either attached to the scraper equipment and the scrapers are run the length of the house or the scrapers are run the entire length of the house and the manure on the end of the scraper is hand swabbed with the sponge. Manure swabs are placed individually in separate Whirl-Pak bags and saturated with skim milk. If manure pits are unsuitable for dragging, 50% of each egg de-escalator belt along with an area of 10 to 12 feet of the associated egg belt is sampled. One swab is taken on each side of the bank and combined in a single Whirl-Pak bag. In addition, a set of two drag swabs (sponges attached to the sampling rod) from the length of two separate walkways is taken comprising a Whirl-Pak sample. Whirl-Pak bags are promptly placed on ice packs in a cooler within the poultry house and forwarded to one of three participating Pennsylvania Animal Diagnostic Laboratories System (PADLS) for culture.

Collection of eggs. Either 480, 1000 or 4000 visibly clean eggs were collected in a manner representative of all hens in the house according to PEQAP standards (1). Eggs were either hand gathered prior to processing directly from all cage tiers, collected during egg processing or collected from eggs stored in the farm cooler. Eggs were transported to participating Pennsylvania Animal Diagnostic Laboratories System for culture.

Culture of *S. enteritidis* from environmental samples. The outside of each Whirl-Pak bag is washed separately with Environ One-Stroke disinfectant and rinsed. One hundred ml of Hajna tetrathionate broth with iodine is added. The bags are incubated at 42C for 18-24 hours. Brilliant green agar (BGA) and xylose-lysine-deoxycholate (XLD) agar plates are inoculated with a sterile swab. The plates are incubated for 37C for 18-24 hours. Following incubation, plates are examined and any pink or black colonies are selected from each media. Triple Sugar Iron (TSI) and Lysine Iron Agar (LIA) slants are inoculated and butts of tubes stabbed with 3 to 5 suspect colonies each. The Hajna tetrathionate broth bags are re-incubated for an additional 18-24 hours if no suspect colonies are detected on the initial plating of BGA and XLD plates (extended incubation). Similarly, an additional set of BGA and XLD plates are streaked for isolation of

Salmonellae. Typical *Salmonellae* isolates are plated on MaConkey agar for purity and serogroup evaluation. Suspect isolates are tested by slide agglutination with polyvalent A-1 and V1 antiserum. Positive isolates are tested for group D₁ specific antiserum reaction. Any D₁ positive isolates are submitted on TSA agar slants to NVSL or University of Pennsylvania, New Bolton Center (PADLS) for stereotyping.

Culture of *S. enteritidis* from eggs. Any visible material on the egg surface is removed. Eggs are disinfected with a 3:1 alcohol/iodine solution (70% ethanol and 7% Lugol's Iodine tincture). Eggs are cracked aseptically with knives that are soaked in ethanol, flamed and cooled prior to striking the egg. The entire contents of 20 eggs are pooled into one 42 ounce Whirl-Pak bag with the air removed. The bags are thoroughly mixed by hand to blend the yolk and albumen. The bags are incubated at room temperature of 20 to 25C for 3 to 5 days. The bag top is sprayed with a disinfectant with Nolvasan or Synphenol prior to swabbing. Brilliant green agar and XLD plates are inoculated with a sterile swab. These plates are incubated at 37C for 18 to 24 hours. The egg sample bags are retained while testing is finished. Three to five colonies either pink or black from BGA or XLD agar respectively, are transferred to TSA and LIA agar slants. The remaining isolation methods are similar to environmental isolation.